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Distribution and sources of anthropogenic 233,236U in the South China Sea

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Uranium-233 (233U) and uranium-236 (236U) in the environment mainly originate from human nuclear activities. Based on the long half-lives and high solubility of uranium, 236U and 233U can be used as powerful tracers for the investigation of oceanographic and environmental processes. However, insufficient work limits the understanding of the source items of anthropogenic 233,236U in the South China Sea (SCS) and the assessment of their environmental process, which are of great importance to the identification of potential radioactive pollutant sources. This study, for the first time, reported the 236U and 233U levels of 64 surface seawaters collected in the SCS from August to September 2018. The measured 236U/238U and 233U/238U atomic ratios are (0.99-1.15)E–9 and (1.1-49.5)E–12, which are respectively higher than their natural backgrounds of E–14-E–10 and E–14-E–11, indicating that the SCS were obviously affected by the human nuclear activities. In comparison to the reprocessing-plant-affected 236U/238U in the Baltic Sea (1.42-22.5)E–9, the input of anthropogenic 236U to the SCS is mainly from the contribution of the global fallout. Furthermore, by performing the 129I/236U-236U/238U mixing model, our data demonstrated that the global fallout was the major contributor to the 236U in the SCS at the moment of sampling. This study aims to open up an avenue for the study of uranium-isotope tracing and add essential information for future assessments of environmental radioactivity in the SCS.

Student Submission

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